

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in and relating to Couplings for Hoses and the like

We, AVIMO LIMITED of Taunton in the County of Somerset, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to couplings for uniting lengths of hose, piping or conduits together or connecting such to fixed junction units (hereinafter in general referred to as hose) of the type which are self-sealing when the coupling units are released and disconnected or which are valveless for straight throughway flow. This type of coupling is composed of two coupling units, one on each hose end, which are hereinafter referred to as "coupling pairs". One unit of each coupling pair is a plug or spigot element and the other a socket, the two being joined together by suitable manually releasable connecting means.

A self-sealing unit of the above type is provided with a spring-loaded mobile valve member cooperating with an axially fixed member on the other unit of a coupling pair, which axially displaces the mobile valve member to effect the valve opening operation automatically as the pair of units are axially thrust together in making the coupling, thereby permitting fluid to flow along the hose or pipeline through the junction. This engagement of the said members also effects a seal between the units, preventing escape of fluid from the coupling. When uncoupling occurs the mobile valve member under the action of its spring closes so that no fluid can pass through it.

Coupling pairs of the above type are frequently employed on hoses each conveying fluids having different characteristics and for convenience in installation these hoses are grouped together in a set with their coupling pairs more or less adjacent. It will be appreciated that after more than one coupling pair has been uncoupled, it may be essential in

recoupling to be certain that the correct pair of units should be reunited. Although there may be a colour scheme differentiation associated with a set of hoses it may, nevertheless, happen that a mistake will occur and that in recoupling a wrong coupling pair is united, with inconvenient or disastrous results.

The aim of the present invention is positively to prevent mistakes of the above kind taking place by eliminating the possibility of making a hose junction other than between a hose length conveying a particular fluid with another hose intended for that particular fluid.

According to the invention each unit of a coupling pair is provided with complementary wards and the number or disposition or other characteristic of the wards is such that of a set of coupling pairs only the units of a coupling pair having corresponding wards can be engaged to make ready for the connection securing the coupling.

In the preferred form the wards of one unit of a pair are in the form of axially extending keys separated by parallel slots distributed circumferentially about the axis of one unit while the wards of the appropriate complementary unit of the pair comprise circumferentially spaced studs, the studs and stud spaces and the keys and slots being respectively dimensioned and positioned such that the studs may pass through the slots and the keys through the stud spaces.

The invention further consists in a set of coupling pairs for a corresponding number of hoses, each coupling pair of the set having the number or arrangement of their wards different from those of other pairs of the set.

The coupling connecting means for releasably securing a coupling pair together may be in the form of a rotary sleeve coaxial with the coupling and mounted on one of the units of a coupling pair. The engaging means on the connecting means may be in the form of a single or multistart screwthread or interrupted cams, or in the form of bayonet catch

members. In the case of the latter engaging means, the bayonet slots have re-entrant locking recesses for the reception of the bayonet studs, which are resiliently retained in said re-entrants by the reaction of springs, preferably the valve springs of the self-sealing valves within the coupling pairs such that before a bayonet connection can be released by partial rotary motion, relative manual axial displacement must take place between the bayonet studs and their slots.

In the accompanying drawings:—

Figs. 1 and 2 are sectional side elevations or plans of the units of a coupling pair exemplifying one form of the invention, Fig. 1 illustrating a socket unit with external bayonet catch studs and Fig. 2 (partly in section) illustrating a spigot unit with bayonet catch slots formed in a revoluble member.

Figs. 3 and 4 are elevations partly in section, in which the socket unit, Fig. 3, has bayonet catch recesses, and the spigot unit, Fig. 4, has inwardly projecting bayonet studs on a revoluble member.

Figs. 5 and 6 are sectional elevations of a socket and a spigot unit, respectively, of a coupling pair adapted to be secured together by screwthreaded means. These figures also illustrate the application of the invention to valveless couplings.

Figs. 7, 8 and 9 are diagrams illustrating several of many different circumferential arrangements and different cross-sectional shapes or areas which may be adopted for the wards of coupling pairs such that only predetermined like units of a set of pairs of units can be engaged together.

In carrying the invention into effect according to one mode as described by way of example, the socket unit (see Fig. 1) of a coupling pair comprises a cylindrical valve casing or housing 1 having a rearward extension sleeve 2 of smaller diameter into which a ferrule 3 is screwed for connecting the hose line to the casing. The interior of the casing is a plain cylinder of uniform diameter with the exception that at the forward end a series of inward projections in the form of ward studs 4 are located in a plane at right-angles to the axis of the casing. These studs are spaced apart to leave passageways 4a between them to receive other wards formed on the spigot unit of the coupling pair.

On the exterior of the casing adjacent the forward end thereof and on diametrically opposite sides thereof a pair of bayonet catch studs 5 projects radially from the casing. These studs are preferably the shape of a rhomboid or rhombus in plan.

The spigot unit (Fig. 2) of the coupling pair comprises a cylindrical valve casing or housing 6 which at its forward end is formed with a fixed valve seat 7 surrounded by a front annular face which may have an annular rib thereon. Towards its rear the casing

is internally screwthreaded to receive a spider mounting 8 for the spigot valve 9 (described hereinafter) and the screwthreaded end of a ferrule 10 for hose attachment. The exterior of the spigot casing is of less diameter than the socket cylinder 1 by an amount equal to the radial dimensions of the ward studs 4 on said socket and has a series of axially extending projecting ribs or ward keys 11 corresponding in number and position with the studs on the socket unit. The keys are spaced apart by slots or passages 11a of a width suitable to permit the studs 4 to slide there-through. Rearwardly of and spaced from the keys, the exterior surface of the socket casing has a circumferential groove or rebate 12 on the rearward side of which is a narrow groove into which is sprung a split ring 12a converting the rebate into a groove for seating the radial part or flange of a sleeve-like revoluble coupling connecting member 13 (hereinafter called the connecting sleeve), which has an internal diameter slightly greater than that of the exterior diameter of the socket casing 1, so that the connecting sleeve 13 may readily slide thereover and be given a partial rotary movement. Inward from the front end of the connecting sleeve, diametrically opposite bayonet slots 13a are cut and shaped for the accommodation of the bayonet studs 5 of the socket unit. These slots are angled, the forward portions thereof extending rearwardly in a longitudinal direction and having a portion extending transversely as in the known bayonet slot fashion. The forward edge of the transverse portion is provided with a re-entrant or bay which is undercut or cut back at an angle to conform with the rhomboidal shape of the studs on the socket unit.

It will be appreciated that the number and spacing of the respective ward keys and ward studs are complementary to one another and that before the bayonet slots 13a of the connecting sleeve 13 can be engaged by the bayonet studs 5, the studs and key slots must be brought into registration and slid longitudinally with respect to one another. Thus the pair of units can only have their bayonet connection effected when these keys 11 and studs 4 are the appropriate ones, as they act as wards preventing any spigot or socket being mated with another and different arrangement of studs and keys.

In a modification of the bayonet catch arrangement (see Figs. 3 and 4), instead of providing bayonet studs on the socket unit this part may be provided with bayonet slots or recesses 13b cut in the exterior of its cylindrical casing 1 at its forward end, while the revoluble connecting sleeve 13 on the spigot has internally projecting bayonet studs 5a, thereby providing the reciprocal of the arrangement described above.

According to a modification, the connecting securing means may be of the plain screw-

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threaded type or have multi-start or interrupted threads or cams, for example, in order to provide a coupling pair connected by screwthreaded means instead of by a bayonet catch arrangement, the forward portion of the exterior of the socket is screwthreaded externally at 14 (see Fig. 5) and no bayonet studs are provided and the connecting sleeve 13 (Fig. 6) of the spigot unit is correspondingly internally screwthreaded, as at 15, such that by revolving the screwthreaded sleeve upon the socket unit after the wards 4 and 11 have been engaged, the two units may be drawn and tightened up together to complete the coupling. Figs. 5 and 6 also serve to illustrate the invention applied to coupling units of the type which are not self-sealing but are valveless and have a straight through-way flow in the socket unit and in the spigot unit.

The internal valve arrangement for the socket and spigot unit may be of a suitable form of the type described; it is, however, preferred to provide the socket unit with a fixed central valve member 16 having a coned head 16a and a screwthreaded opposite end which is screwed into the rearward sleeve extension 2 of the casing communicating with the hose. As to its forward portion the valve is a solid member but at the rear adjacent the screwthreaded part the solid portion is divided into legs 16b having fluid passage orifices between the legs so that it may have free access to the valve chamber. Cooperating with the conical valve head is an annular mobile pistonlike valve seat 17, the forward portion of which has a rubber or like resilient annular cap 17a the inner periphery of which is coned to agree with the conical valve head 16a while the outer peripheral portion is adapted to slide within the interior surface of the cylindrical casing.

This rubber element 17a has a flat front annular face for engaging the face and rib of the spigot member surrounding its valve to seal the coupling pair when connected to prevent escape of fluid passing externally. Towards the rear the piston member 17 has a rubber skirt or cup member 17b to effect a sliding seal against the pressure fluid in the coupling. A compression spring is located coaxially around the fixed valve stem 16 and abuts against the under surface of the seating end of the piston and the rear of the socket casing.

The spider 8 of the spigot referred to above has a central bearing or bore of substantial longitudinal extent to serve as a slideway for the stem of a central mobile valve member 9. Between the valve head and the spider a compression spring is located coaxially around the valve stem so that the spring normally acts to hold the valve closed.

The springs acting on the mobile valve members in both units serve, in addition to their valve closing function, to maintain the

bayonet stud and bayonet slot in position when the coupling pair are connected together.

In coupling two lengths of hose together paired socket and spigot units are presented axially together with the ward studs 4 and key slots in register so that the one may slide into the other. On continuing this action the head of the fixed valve on the socket will engage the mobile valve on the spigot and the front face of the spigot casing will engage the mobile valve seat 17 of the socket unit whereby both valves will be unseated and open for the passage of fluid, this action at the same time causing the pair of units to be sealed against external escape of fluid by reason of the rib on the spigot face engaging the flat face of the mobile valve seat 17. At the same time the bayonet slots 13a are engaged with the bayonet studs 5 and the bayonet connecting sleeve is given a fractional turn to complete the connection when the studs lie in their terminal position in the bayonet slots. If an attempt is made to engage a socket or a spigot unit of another pair having different wards, this is frustrated or blocked by lack of register between the wards, thereby preventing a wrong connection being established.

In the form of the invention in which the connecting means are of the screwthreaded type, the coupling action is similar to that above described with the exception that after the appropriate pair of spigot and socket units have been presented with their wards in register and axially displaced to the required amount, the screwthreaded connecting sleeve 13 (Fig. 6) is revolved upon the screwthread 14 (Fig. 5) of the socket until the pair of units are tightly connected together.

The coupling pairs of a set of couplings for a corresponding plurality of hose lengths are provided each with wards having different characteristics such that only the appropriate paired units can be connected together.

In order to provide different wards for each respective coupling pair the ward studs and ward keys may be varied as to number, spacing interval or other characteristic by a combination of the characteristics so that no two coupling pairs are alike and fit one another, thereby removing any danger of wrong units or hose lengths being connected together.

In Figs. 1—4 one suitable arrangement of wards is illustrated, while in the diagram, Fig. 7 another arrangement is exemplified where the spacing interval of the wards and the number of wards are different from those of Figs. 1—4.

In Figs. 8 and 9 examples are diagrammatically shown of the employment of wards with irregular spacing and of different shape or area in cross section. It will be thus appreciated that a great number of combinations may be devised for a corresponding number

of units to be paired which are different from any other pair of units such that no wrong connections can be established.

What we claim is:—

5 1. Hose couplings of the type described of which a coupling pair is provided with complementary wards the number, disposition or other characteristic of which is such that of a set of coupling pairs only the units of a coupling pair having corresponding wards can be engaged for securing the coupling.

10 2. Hose couplings as claimed in claim 1, wherein the complementary wards of each pair of a set of coupling pairs are distributed circumferentially about the coupling axis in a different angular position from those of other pairs.

15 3. Hose couplings as claimed in claim 1, wherein the complementary wards of a set of coupling pairs have the wards of each pair of different cross-sectional shape or area from those of other pairs of the set.

4. Hose couplings as claimed in claim 1,

wherein the complementary wards of a set of coupling pairs have some of the wards of each pair disposed circumferentially in different angular positions from other pairs and also are or have other wards of different cross-sectional shape or area.

25 5. Hose couplings as claimed in any of the preceding claims, wherein the connection securing means of a coupling pair are of the bayonet catch type.

30 6. Hose couplings as claimed in any of the claims 1—4, wherein the connection securing means of a coupling pair are of the screw-threaded, plain, multistart or interrupted thread or cam type.

35 7. Hose couplings as claimed in any of the claims 1—4, wherein one part of the connection securing means is on a member which is revoluble on the unit on which it is mounted.

40 8. Hose couplings substantially as described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in and relating to Couplings for Hoses and the like

45 We, AVIMO LIMITED of Taunton in the County of Somerset, a British Company, do hereby declare this invention to be described in the following statement:—

50 This invention relates to couplings for uniting lengths of the hose, piping or conduits together or connecting such to fixed junction units (hereinafter in general referred to as hose) of the type which are self-sealing when the coupling units are released and disconnected. This type of coupling is composed of two coupling units, one on each hose end, which are hereinafter referred to as "coupling pairs". One unit of each coupling pair is a plug or spigot element and the other a socket, the two being joined together by suitable manually releasable connecting means. Each unit of a pair is provided with a spring-loaded mobile valve member cooperating with a fixed valve member to effect the self-sealing action when a coupling is disconnected. The fixed valve member of each unit engages and axially displaces the mobile valve member of the other unit as the pair of units are axially thrust together to make a coupling, thereby opening the valves and permitting fluid to flow along the hose or pipeline through the junction. This engagement also effects a seal between the units, preventing escape of fluid from the coupling. When uncoupling occurs the respective mobile valve member under the action of its spring makes sealing engagement with its complementary fixed valve member so that no fluid can pass through either valve from the separated units.

80 Coupling pairs of the above type are frequently employed on hoses each conveying

fluids having different characteristics and for convenience in installation these hoses are grouped together in a set with their coupling pairs more or less adjacent. It will be appreciated that after more than one coupling pair has been uncoupled, it may be essential in recoupling to be certain that the correct pair of units should be reunited. Although there may be a colour scheme differentiation associated with a set of hoses it may nevertheless happen that a mistake will occur and that in recoupling a wrong coupling pair is united, with inconvenient or disastrous results.

95 The aim of the present invention is positively to prevent mistakes of the above kind taking place by eliminating the possibility of making a hose junction other than between a hose length conveying a particular fluid with a hose intended for that particular fluid.

100 According to the invention each unit of a coupling pair is provided with complementary wards and the number or disposition or other characteristic of the wards is such that of a set of coupling pairs only the units of a coupling pair having corresponding wards can be engaged to make ready for the connection securing the coupling.

110 In the preferred form the wards of one unit of a pair are in the form of axially extending keys separated by parallel slots while the wards of the appropriate complementary unit of the pair comprise spaced studs, the studs and stud spaces and the keys and slots being respectively dimensioned and positioned such that the studs may pass through the slots and the keys through the stud spaces.

The invention further consists in a set of coupling pairs for a corresponding number of hoses, each coupling pair of the set having the number or arrangement of their wards different from those of other pairs of the set.

The coupling connecting means for releasably securing a coupling pair together may be in the form of a rotary sleeve coaxial with the coupling and mounted on one of the units of a coupling pair. The engaging means on the connecting means may be in the form of a single or multistart screwthread or interrupted cams, or in the form of bayonet catch members. In the case of the latter engaging means, the bayonet slots have re-entrant locking recesses for the reception of the bayonet studs, which are resiliently retained in said re-entrants by the reaction of springs, preferably the valve springs of the self-sealing valves within the coupling pairs such that before a bayonet connection can be released by partial rotary motion relative manual axial displacement must take place between the bayonet studs and their slots.

In carrying the invention into effect according to one mode as described by way of example, the socket unit of a coupling pair comprises a cylindrical valve casing or housing having a rearward extension sleeve of smaller diameter into which a ferrule is screwed for connecting the hose line to the casing. The interior of the casing is a plain cylinder of uniform diameter with the exception that at the forward end a series of inward projections in the form of ward studs are located in a plane at right-angles to the axis of the casing. These studs are spaced apart to leave passageways between them formed on the spigot unit of the coupling pair.

On the exterior of the casing adjacent the forward end thereof and on diametrically opposite sides thereof a pair of bayonet catch studs projects radially from the casing. These studs are preferably the shape of a rhomboid or rhombus in plan.

The spigot unit of the coupling pair comprises a cylindrical valve casing or housing which at its forward end is formed with a fixed valve seat surrounded by a front annular face which may have an annular rib thereon. Towards its rear the casing is internally screwthreaded to receive a spider mounting for the spigot valve (described hereinafter) and the screwthreaded end of a ferrule for hose attachment. The exterior of the spigot casing is of less diameter than the socket cylinder by an amount equal to the radial dimensions of the ward studs on said socket and has a series of axially extending projecting ribs or ward keys corresponding in number and position with the studs on the socket unit. The keys are spaced apart by slots of a width suitable to permit the bayonet studs to slide therethrough. Rearwardly of and spaced

from the keys, the exterior surface of the socket casing has a circumferential groove or a rebate on the rearward side of which is a narrow groove into which is sprung a split ring converting the rebate into a groove.

Within the rebate groove and revoluble therein is the radial part or flange of a sleeve-like coupling connecting member (hereinafter called the connecting sleeve), the interior of which has an internal diameter slightly greater than that of the exterior diameter of the socket casing, so that the connecting sleeve may readily slide thereover and be given a partial rotary movement. Inward from the front end of the connecting sleeve, diametrically opposite bayonet slots are cut and shaped for the accommodation of the bayonet studs of the socket unit. These slots are angled, the forward portion extending rearwardly in a longitudinal direction and have a portion extending transversely in the known bayonet slot fashion. The forward edge of the transverse portion is provided with a re-entrant or bay which is undercut or cut back at an angle to conform with the rhomboidal shape of the studs on the socket unit. Between the groove or rebate in which the bayonet slot connecting sleeve is rotatably mounted and the rearward termination of the ward keys, an annular clearance is left and into which the key slots open for the reception of the ward studs on the socket unit.

It will be appreciated that the number and spacing of the respective ward keys and ward studs are complementary to one another and that before the bayonet slots of the connecting sleeve can be engaged by the bayonet studs, the studs and key slots must be brought into registration and slid longitudinally with respect to one another. Thus the pair of units can only be engaged and the bayonet connection effected when these keys and studs are the appropriate ones, as they act as wards preventing any spigot or socket being mated with another and different arrangement of studs and keys.

In a modification of the bayonet catch arrangement, instead of providing bayonet studs on the socket unit this part may be provided with bayonet slots cut in the exterior of its cylindrical casing at its forward end, while the revoluble connecting sleeve on the spigot has internally projecting bayonet studs, thereby providing the reciprocal of the arrangement described above.

According to a modification, in order to provide a coupling pair connected by screwthreaded means instead of by a bayonet catch arrangement, the forward portion of the exterior of the socket is screwthreaded externally and no bayonet studs are provided and the connecting sleeve of the spigot unit is correspondingly internally screwthreaded such that by revolving the screwthreaded sleeve upon the socket unit after the ward has been

engaged, the two units may be drawn and tightened up together to complete the coupling.

5 The internal valve arrangement for the socket and spigot unit may be of a suitable form of the type described; it is however preferred to provide the socket unit with a fixed central valve member having a coned head and a screwthreaded opposite end which is screwed
10 into the rearward sleeve extension of the casing communicating with the hose. As to its forward portion the valve is a solid member but at the rear adjacent the screwthreaded part the solid portion is divided into legs
15 having fluid passage orifices between the legs so that it may have free access to the valve chamber. Cooperating with the conical valve head is an annular mobile pistonlike valve seat, the forward portion of which has a rubber or like resilient annular cap the inner
20 periphery of which is coned to agree with the conical valve head while the outer peripheral portion is adapted to slide within the interior surface of the cylindrical casing.

25 This rubber element has a flat front annular face for engaging the face and rib of the spigot member surrounding its valve to seal the coupling pair when connected to prevent escape of fluid passing externally. Towards
30 the rear the piston member has a rubber skirt or cup member to effect a sliding seal against the pressure fluid in the coupling. A compression spring is located coaxially around the fixed valve stem and abuts against the under
35 surface of the seating end of the piston and the rear of the socket casing.

The spider of the spigot referred to above has a central bearing or bore of substantial longitudinal extent to serve as a slideway for
40 the stem of a central mobile valve member. The stem of the spigot valve terminates forwardly in a conical valve head which co-operates with the fixed conical valve seating which may be lined with a rubber or like
45 annulus. Between the valve head and the spider a compression spring is located coaxially around the valve stem so that the spring normally acts to hold the valve closed. The springs acting on the mobile valve mem-
50 bers in both units serve, in addition to their valve closing function, to maintain the bayonet stud and bayonet slot re-entrant in the locked position when the coupling pair are connected together.

55 In coupling two lengths of hose together the socket unit and the spigot unit are presented axially together with the ward studs and key slots in register so that the one may slide into the other.

On continuing this action the head of the fixed valve will engage the socket unit and the mobile valve on the spigot and the front face of the latter will engage the mobile valve seat of the socket unit. Continued axial pressure will cause the respective valves to open
60 for the passage of fluid, this action at the same time causing the pair of units to be sealed against external escape of fluid by reason of the rib on the spigot face engaging the flat face of the mobile piston member of the socket unit. The axial thrust on the units is continued until the bayonet slots can be engaged with the bayonet studs, when the bayonet connecting sleeve is given the frac-
65 tional turn to engage the slots with the studs which then enter or snap into the re-entrant of the bayonet slots and reside therein in a locked condition under the pressure of the valve springs until a manipulative action is effected to cause unlocking and disengagement
70 of the slots.

The valve spring in the socket unit and in the spigot unit operating respectively upon the mobile seat of the socket unit and upon the mobile valve of the spigot unit, with the
75 valves in the open position, will afford a resilient pressure tending to thrust the units apart and this pressure will hold the studs locked in the re-entrant portion of the bayonet slot until the studs are manipulated out of the re-entrants by pressing the units together and then rotating the connecting sleeve slightly.

In the form of the invention in which the connecting means are of the screwthreaded type the coupling action is similar to that
80 above described with the exception that after the spigot and socket units have been presented with their wards in appropriate register and axially displaced to the required amount, the screwthreaded connecting sleeve
85 is revolved upon the screwthread of the socket until the pair of units are tightly connected together.

The coupling pairs of a set of couplings for a corresponding plurality of hose lengths
90 are provided each with different wards such that only the appropriate units can be connected together.

In order to provide different wards for each respective coupling pair the ward studs and ward keys may be varied as to number,
95 spacing interval or other characteristic by a combination of the characteristics so that no two coupling pairs are alike and fit one another, thereby removing any danger of
100 wrong units or hose lengths being connected together.

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